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ANALYSIS OF ENHANCED HOP BY HOP FEEDBACK BASED HIERARCHICAL MPLS PROTOCOL

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ABSTRACT

MPLS network is based on label based packet forwarding within the network but as the network grows the MPLS network causes delay than the normal network as routing table to label table lookup is required at the ingress and egress routers. To overcome this problem hierarchical MPLS network was proposed which is better in larger network. In this paper we proposes a feedback based hierarchical network which gives feedback on hop by hop basis within the network which also reduces the delay time of the network in case of packet loss and provide more security than the existing network.

KEYWORDS: MPLS, Hierarchical MPLS, Labels, Edges Routers, Switch Routers

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INTRODUCTION

Multiprotocol label switching (MPLS) is an emerging technology which is based on label based packet forwarding at the local network. The packets enter within an MPLS network through ingress label edge router where routing table maps with the label table created in the MPLS network using label distribution protocol (LDP) or resource reservation protocol (RSVP) and thus a label is attached in the IP packets which gives the address of the next hop within the MPLS network for forwarding based on labels attached. Based on the information provided by the control plane of the router, label forwarding information base (LFIB) is created in the data plane of the router. Thus, forwarding information base table and label forwarding information base table resides in the data plane of the router, whereas routing information table resides in the control plane of the router from which the best path is kept in the forwarding information base table.[1,3,8] Label distribution table and resource reservation protocol are used for finding the best label path from ingress edge router to egress edge router and thus assign labels in the label forwarding information table based on these criteria.

Hierarchical multiprotocol label switching protocol is designed based on the time taken by the MPLS network in large network. This designed network divides the MPLS network into small networks and consolidates the larger network into smaller one network. Thus, reduces the problem of time taken in the large network and thus minimizes the time taken.[12,15,17]

Concentrating on MPLS network, which is based on end-to-end signaling of error detection through which a large time is consumed to get back the information by the sender in case of packet failure or destination

unreachable.

This drawback is removed by proposing a hop-by-hop protocol which searches error based on hop by hop using piggybacking at each hop and thus ensure that the packet reaches at each hop and if packet fails at any hop then needn't to wait till the acknowledgement is delivered by the edge router.[2,19,20]

Within the MPLS network, label edge router plays a role of mapping of IP routing table with the label table and attach a label as enters within the MPLS network through ingress label edge router. Then, from MPLS ingress edge router label swapping is done by the label switch router which are the intermediate router of the MPLS network while egress label edge router again maps label table with the IP table and label is detached so that the packet can be forwarded based on IP addressing.[3,5,9] In case of small network and larger network the mapping of IP address with the label and again label with the IP address is time consuming and takes a larger time. Here in this paper we based our study on these algorithms and focusses on these problems proposes a new design of MPLS network which overcome these problems and provide a time efficient network.[4,5]

METHODS AND METHODOLOGY USED

Here a new design is proposed for MPLS network which sub-divides the whole MPLS network into small network where packets flow based on labels within the sub-network. In the packets of MPLS which is of 32 bits 20 bits are reserved for label, 3 bits for quality of service which can be of time of service or class of service whereas 1 bit show bottom of stack for service implementation and 8 bits are reserved for TTL. Of the 20 bits that are reserved for label we allocate 19 bits for label and 1 bit will be reserved for error detection, the bit in this position will represent that the path is free for the next bit to be send or not.

This bit is assigned with label 0 if there is congestion or the packet not reached to the next hop router and will be assigned to 1 if the label successfully reached to the next hop router. Based on this, we get the prior intimation of the packet received at the next hop or not without using the bandwidth and thus prevent end-to-end error detection in the MPLS network.

ALGORITHM

Per hop based Hierarchical MPLS network

Input

A network with more than 6 routers

Output

Time efficient and error free transmission of packets within the network

METHODS

Implement a network with n number of router (where n>6)

Select a network with m number of nodes

Where m<n (3<m<7)

Set IP address to each router interface

Enable MPLS with LDP/ RSVP protocol on each interface of the router with each label assigned to each minor network and within the minor network again MPLS is enabled with LDP/RSVP. Label sizes of 20 bits are used for label allocation within the MPLS network.

Enable piggybacking within the MPLS network and sub network

Enable any IGP protocol like OSPF/EIGRP/RIP for finding the best route and building of forwarding information table and routing information table

Thus complexity of the network will become

$O(|E|+V \log |V| + T)$

Where E is the edges of the network

V is number of nodes of the network

T is the time taken to swap between IP address with label and label with IP address

ALGORTIHM FOR ERROR DETECTION

Of 32 bits 20 bits reserved for label allocation allocate 1 bit for feedback of the 20 bits.

Bit = 0 (Packets not received at the next hop)

Bit =1 (packets received at the next hop)

This feedback bit is attached with the packets as a piggy backing technique and this bit will give the status of congestion within the network on hop by hop basis.

RESULTS

This paper suggested a new approach which enhances time complexity of the MPLS network by dividing a large network into small networks which further reduces the time taken by the packet to reach from source to destination of the network. This proposed model also provides a methodology of providing a congestion free path on per router basis rather than end to end. Where value of bit can be represented by 0 and 1 which shows that there is congestion or not. Where value 1 represent the path as congested whereas value 0 represent path is congestion free and thus prevent the congestion within the network.

The result of which gives us the result as below:

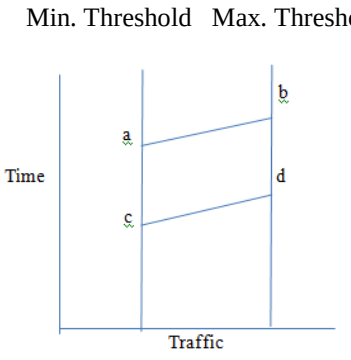

Figure 1

Here we are using a mechanism to enable router participation in both congestion detection and congestion recovery. The packet flow from ingress label edge router to egress label edge router via. Label switch router then it adds a header to the outgoing label of 1 bit indicating congestion in the network. If the value of bits is 0 then it represent congestion in the network. With the use of this technique the congestion flow within the network will be within the limit that is it doesnot exceeds the threshold limit.

Proposed design for the proposed model is as:

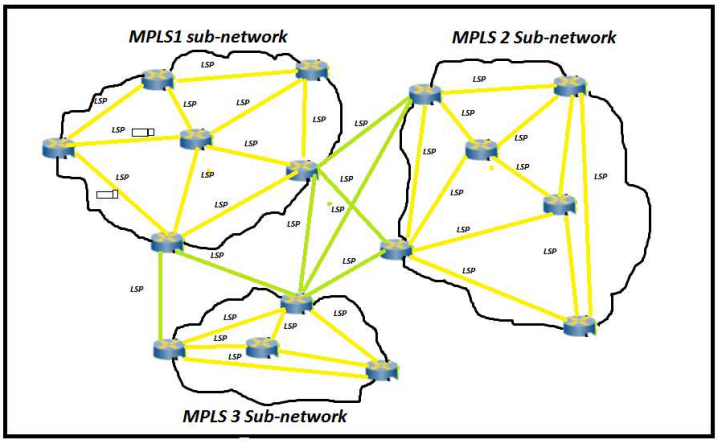

Figure 2: Hierarchical MPLS Network

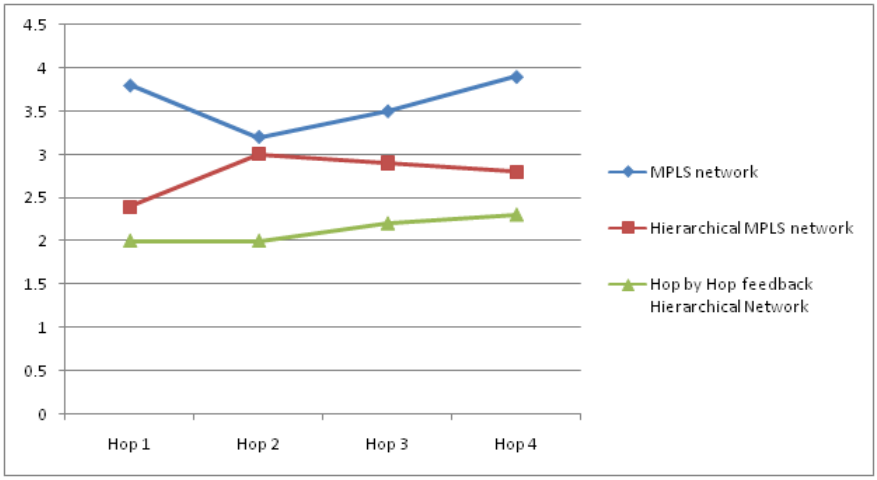

Figure 3

The following graphs shows the comparison of different network with respect to time taken by different network on hop by hop basis and the result shows that the network with hop by hop feedback network will take less time along with more secure than the MPLS network and MPLS hierarchical network.

CONCLUSIONS

Multiprotocol Label Switching network is designed to enhance the speed of the packets to be send from source to destination. Here in this paper we focus on the problem of MPLS network of time taken by the packets in case of large MPLS network. So, we proposed a new design to enhance the speed of the packets travelling from source to destination by using hierarchical MPLS network and also propose a hop-by-hop feedback mechanism for efficient error detection based

on hop-by-hop basis rather than end to end signaling as end to end signaling takes larger time for error detection. Thus, using the proposed design approach we can reduce the time taken by the packets to reach from source to destination and thus make a network more efficient.

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